CLAIMS

What is claimed is:

1. A wireless transmit/receive unit (WTRU) comprising:

(a) a radio receiver comprising a plurality of analog receiver components;

(b) a radio transmitter comprising a plurality of analog transmitter components;

(c) at least one controller; and

(d) a plurality of compensation modules in communication with the controller, the modules for correcting radio frequency (RF) parameter deficiencies that exist in at least one of the radio receiver and the radio transmitter, whereby RF parameter requirements established for one or more of the analog receiver and transmitter components are relaxed.

2. The WTRU of claim 1 wherein the analog receiver components include at least one low noise amplifier (LNA) in communication with the controller, and one of the modules sends an LNA flag signal to the controller to turn on or off the LNA depending upon whether the power level of signals received by the radio receiver fall below a predetermined power level threshold.

3. The WTRU of claim 1 wherein the analog transmitter components include at least one power amplifier (PA) having an RF parameter deficiency that fails to meet at least one of the established RF parameter requirements, and, based on the characteristics of the PA, at least one of the modules corrects the RF parameter deficiency by purposely distorting at least one of phase and amplitude of signals processed by the PA such that the PA generates a linear response rather than a distorted response.

4. The WTRU of claim 1 wherein the analog transmitter components include at least one modulator having an RF parameter deficiency that fails to meet at least one of the established RF parameter requirements, and at least one of the modules corrects the RF parameter deficiency by balancing at least one of phase and amplitude of signals output from the modulator.

5. The WTRU of claim 4, wherein the modulator has two signal inputs including an in-phase (I) input and a quadrature (Q) input.

6. The WTRU of claim 1 wherein the analog transmitter components include at least one modulator having an RF parameter deficiency that fails to meet at least one of the established RF parameter requirements, and at least one of the modules corrects the RF parameter deficiency by compensating for an inaccurate direct current (DC) offset level output from the modulator.

7. The WTRU of claim 1 wherein the analog receiver components include at least one low pass filter (LPF) having an RF parameter deficiency that fails to meet at least one of the established RF parameter requirements, and at least one of the modules corrects the RF parameter deficiency by increasing the sampling rate of signals received by the radio receiver.

8. The WTRU of claim 1 wherein the analog receiver components include at least one amplifier having a gain deficiency that fails to meet at least one of the established RF parameter requirements, and at least one of the modules corrects the gain deficiency by simulating a reduction in the number of poles of high pass filter (HPF) stages in the amplifier.

9. The WTRU of claim 1 wherein at least one of the modules keeps the output power of the radio receiver constant irrespective of the level of input power

received by the radio receiver, and in-phase (I) and quadrature (Q) signal outputs of the receiver are normalized using average power of the signal outputs combined over n number of samples.

10. The WTRU of claim 1 wherein the analog receiver components include at least one low pass filter (LPF) having an RF parameter deficiency that fails to meet at least one of the established RF parameter requirements, and at least one of the modules corrects the RF parameter deficiency by compensating for phase variation over frequency.

11. The WTRU of claim 1 wherein the analog receiver components include at least demodulator having an RF parameter deficiency that fails to meet at least one of the established RF parameter requirements, and at least one of the modules corrects the RF parameter deficiency by balancing at least one of phase and amplitude of signals output from the modulator.

12. The WTRU of claim 1 further comprising:

(a) at least one analog to digital (ADC) gain control circuit in communication with the radio receiver; and

(b) at least one low pass filter (LPF) in communication with the ADC gain control circuit and at least one of the compensation modules, wherein the analog receiver components are introduced to a digital domain established to enhance the performance characteristics of the radio receiver.

13. The WTRU of claim 12, wherein the ADC gain control circuit enhances dynamic range of the radio receiver and compensates for channel loss variation, the ADC gain control circuit comprising:

(i) at least one logarithmic amplifier for compressing the dynamic range of analog signals received from the radio receiver to adjust the dynamic range of the analog signals;

(ii) at least one analog to digital converter (ADC) in communication with the logarithmic amplifier, the ADC for digitizing the output of the logarithmic amplifier; and

(iii) at least one look up table (LUT) in communication with the ADC, wherein the LUT provides anti-logarithmic functionality and in order to decipher the digital domain output by the ADC.

14. In a wireless system including a radio receiver comprising a plurality of analog receiver components and a radio transmitter comprising a plurality of analog transmitter components, a method for enabling radio frequency (RF) parameter requirements established for one or more of the analog receiver and transmitter components to be relaxed, the method comprising:

(a) providing a plurality of RF parameter compensation modules;

(b) detecting the existence of one or more RF parameter deficiencies that exist in at least one of the radio receiver and radio transmitter; and

(c) allocating one or more of the RF parameter compensation modules to correct the RF parameter deficiencies.

15. The method of claim 14 wherein the analog receiver components include at least one low noise amplifier (LNA) in communication with the controller, and one of the modules sends an LNA flag signal to the controller to turn on or off the LNA depending upon whether the power level of signals received by the radio receiver fall below a predetermined power level threshold.

16. The method of claim 14 wherein the analog transmitter components includes at least one power amplifier (PA) having an RF parameter deficiency that fails

to meet at least one of the established RF parameter requirements, and, based on the characteristics of the PA, at least one of the modules corrects the RF parameter deficiency by purposely distorting at least one of phase and amplitude of signals processed by the PA such that the PA generates a linear response rather than a distorted response.

17. The method of claim 14 wherein the analog transmitter components include at least one modulator having an RF parameter deficiency that fails to meet at least one of the established RF parameter requirements, and at least one of the modules corrects the RF parameter deficiency by balancing at least one of phase and amplitude of signals output from the modulator.

18. The method of claim 17, wherein the modulator has two signal inputs including an in-phase (I)input and a quadrature (Q) input.

19. The method of claim 14 wherein the analog transmitter components include at least one modulator having an RF parameter deficiency that fails to meet at least one of the established RF parameter requirements, and at least one of the modules corrects the RF parameter deficiency by compensating for an inaccurate direct current (DC) offset level output from the modulator.

20. The method of claim 14 wherein the analog receiver components include at least one low pass filter (LPF) having an RF parameter deficiency that fails to meet at least one of the established RF parameter requirements, and at least one of the modules corrects the RF parameter deficiency by increasing the sampling rate of signals received by the radio receiver.

21. The method of claim 14 wherein the analog receiver components include at least one amplifier having a gain deficiency that fails to meet at least one of the

established RF parameter requirements, and at least one of the modules corrects the gain deficiency by simulating a reduction in the number of poles of high pass filter (HPF) stages in the amplifier.

22. The method of claim 14 wherein at least one of the modules keeps the output power of the radio receiver constant irrespective of the level of input power received by the radio receiver, and in-phase (I) and quadrature (Q) signal outputs of the receiver are normalized using average power of the signal outputs combined over n number of samples.

23. The method of claim 14 wherein the analog receiver components include at least one low pass filter (LPF) having an RF parameter deficiency that fails to meet at least one of the established RF parameter requirements, and at least one of the modules corrects the RF parameter deficiency by compensating for phase variation over frequency.

24. The method of claim 14 wherein the analog receiver components include at least demodulator having an RF parameter deficiency that fails to meet at least one of the established RF parameter requirements, and at least one of the modules corrects the RF parameter deficiency by balancing at least one of phase and amplitude of signals output from the modulator.

25. A wireless communications system comprising:

(a) a radio receiver comprising a plurality of analog receiver components;

(b) a radio transmitter comprising a plurality of analog transmitter components; and

(c) at least one digital baseband (DBB) compensation processor including a plurality of radio frequency (RF) compensation modules for correcting RF

parameter deficiencies that exist in at least one of the radio receiver and the radio transmitter, whereby RF parameter requirements established for one or more of the analog receiver and transmitter components are relaxed.

26. The system of claim 25 wherein the analog receiver components include at least one low noise amplifier (LNA), wherein one of the modules sends a signal to turn on or off the LNA depending upon whether the power level of signals received by the radio receiver fall below a predetermined power level threshold.

27. The system of claim 25 wherein the analog transmitter components include at least one power amplifier (PA) having an RF parameter deficiency that fails to meet at least one of the established RF parameter requirements, and, based on the characteristics of the PA, at least one of the modules corrects the RF parameter deficiency by purposely distorting at least one of phase and amplitude of signals processed by the PA such that the PA generates a linear response rather than a distorted response.

28. The system of claim 25 wherein the analog transmitter components include at least one modulator having an RF parameter deficiency that fails to meet at least one of the established RF parameter requirements, and at least one of the modules corrects the RF parameter deficiency by balancing at least one of phase and amplitude of signals output from the modulator.

29. The system of claim 28, wherein the modulator has two signal inputs including an in-phase (I)input and a quadrature (Q) input.

30. The system of claim 25 wherein the analog transmitter components include at least one modulator having an RF parameter deficiency that fails to meet at least one of the established RF parameter requirements, and at least one of the

modules corrects the RF parameter deficiency by compensating for an inaccurate direct current (DC) offset level output from the modulator.

31. The system of claim 25 wherein the analog receiver components include at least one low pass filter (LPF) having an RF parameter deficiency that fails to meet at least one of the established RF parameter requirements, and at least one of the modules corrects the RF parameter deficiency by increasing the sampling rate of signals received by the radio receiver.

32. The system of claim 25 wherein the analog receiver components include at least one amplifier having a gain deficiency that fails to meet at least one of the established RF parameter requirements, and at least one of the modules corrects the gain deficiency by simulating a reduction in the number of poles of high pass filter (HPF) stages in the amplifier.

33. The system of claim 25 wherein at least one of the modules keeps the output power of the radio receiver constant irrespective of the level of input power received by the radio receiver, and in-phase (I) and quadrature (Q) signal outputs of the receiver are normalized using average power of the signal outputs combined over n number of samples.

34. The system of claim 25 wherein the analog receiver components include at least one low pass filter (LPF) having an RF parameter deficiency that fails to meet at least one of the established RF parameter requirements, and at least one of the modules corrects the RF parameter deficiency by compensating for phase variation over frequency.

35. The system of claim 25 wherein the analog receiver components includes at least demodulator having an RF parameter deficiency that fails to meet at least one

of the established RF parameter requirements, and at least one of the modules corrects the RF parameter deficiency by balancing at least one of phase and amplitude of signals output from the modulator.

36. The system of claim 25 further comprising:

(a) at least one analog to digital (ADC) gain control circuit in communication with the radio receiver; and

(b) at least one low pass filter (LPF) in communication with the DBB compensation processor and the ADC gain control circuit, wherein the analog receiver components are introduced to a digital domain established to enhance the performance characteristics of the radio receiver.

37. The system of claim 36, wherein the ADC gain control circuit enhances dynamic range of the radio receiver and compensates for channel loss variation, the ADC gain control circuit comprising:

(i) at least one logarithmic amplifier for compressing the dynamic range of analog signals received from the radio receiver to adjust the dynamic range of the analog signals;

(ii) at least one analog to digital converter (ADC) in communication with the logarithmic amplifier, the ADC for digitizing the output of the logarithmic amplifier; and

(iii) at least one look up table (LUT) in communication with the ADC, wherein the LUT provides anti-logarithmic functionality and in order to decipher the digital domain output by the ADC.

38. An integrated circuit (IC) for use in a wireless communication system including a radio receiver comprising a plurality of analog receiver components, and a radio transmitter comprising a plurality of analog transmitter components, the IC comprising:

(a) at least one controller; and

(b) a plurality of compensation modules in communication with the controller, the modules for correcting radio frequency (RF) parameter deficiencies that exist in at least one of the radio receiver and the radio transmitter, whereby RF parameter requirements established for one or more of the analog receiver and transmitter components are relaxed.

39. The IC of claim 38 wherein the analog receiver components include at least one low noise amplifier (LNA) in communication with the controller, and one of the modules sends an LNA flag signal to the controller to turn on or off the LNA depending upon whether the power level of signals received by the radio receiver fall below a predetermined power level threshold.

40. The IC of claim 38 wherein the analog transmitter components include at least one power amplifier (PA) having an RF parameter deficiency that fails to meet at least one of the established RF parameter requirements, and, based on the characteristics of the PA, at least one of the modules corrects the RF parameter deficiency by purposely distorting at least one of phase and amplitude of signals processed by the PA such that the PA generates a linear response rather than a distorted response.

41. The IC of claim 38 wherein the analog transmitter components include at least one modulator having an RF parameter deficiency that fails to meet at least one of the established RF parameter requirements, and at least one of the modules corrects the RF parameter deficiency by balancing at least one of phase and amplitude of signals output from the modulator.

42. The IC of claim 41, wherein the modulator has two signal inputs including an in-phase (I)input and a quadrature (Q) input.

43. The IC of claim 38 wherein the analog transmitter components include at least one modulator having an RF parameter deficiency that fails to meet at least one of the established RF parameter requirements, and at least one of the modules corrects the RF parameter deficiency by compensating for an inaccurate direct current (DC) offset level output from the modulator.

44. The IC of claim 38 wherein the analog receiver components include at least one low pass filter (LPF) having an RF parameter deficiency that fails to meet at least one of the established RF parameter requirements, and at least one of the modules corrects the RF parameter deficiency by increasing the sampling rate of signals received by the radio receiver.

45. The IC of claim 38 wherein the analog receiver components include at least one amplifier having a gain deficiency that fails to meet at least one of the established RF parameter requirements, and at least one of the modules corrects the gain deficiency by simulating a reduction in the number of poles of high pass filter (HPF) stages in the amplifier.

46. The IC of claim 38 wherein at least one of the modules keeps the output power of the radio receiver constant irrespective of the level of input power received by the radio receiver, and in-phase (I) and quadrature (Q) signal outputs of the receiver are normalized using average power of the signal outputs combined over n number of samples.

47. The IC of claim 38 wherein the analog receiver components include at least one low pass filter (LPF) having an RF parameter deficiency that fails to meet at least one of the established RF parameter requirements, and at least one of the

modules corrects the RF parameter deficiency by compensating for phase variation over frequency.

48. The IC of claim 38 wherein the analog receiver components include at least demodulator having an RF parameter deficiency that fails to meet at least one of the established RF parameter requirements, and at least one of the modules corrects the RF parameter deficiency by balancing at least one of phase and amplitude of signals output from the modulator.

49. The IC of claim 38 further comprising:

(a) at least one analog to digital (ADC) gain control circuit in communication with the radio receiver; and

(b) at least one low pass filter (LPF) in communication with the ADC gain control circuit and at least one of the compensation modules, wherein the analog receiver components are introduced to a digital domain established to enhance the performance characteristics of the radio receiver.

50. The IC of claim 49, wherein the ADC gain control circuit enhances dynamic range of the radio receiver and compensates for channel loss variation, the ADC gain control circuit comprising:

(i) at least one logarithmic amplifier for compressing the dynamic range of analog signals received from the radio receiver to adjust the dynamic range of the analog signals;

(ii) at least one analog to digital converter (ADC) in communication with the logarithmic amplifier, the ADC for digitizing the output of the logarithmic amplifier; and

(iii) at least one look up table (LUT) in communication with the ADC, wherein the LUT provides anti-logarithmic functionality and in order to decipher the digital domain output by the ADC.